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**SOURCE DATA
SMALL ARMS
WEAPONS SYSTEM
STUDY**

USATECOM PROJECT NO 8-5-0400-05

SERVICE TEST
OF
SMALL ARMS WEAPONS SYSTEMS (U)

FINAL REPORT
BY
CAPTAIN WILLIAM P. FARMER

13 DECEMBER 1965

US ARMY ARMOR BOARD

FORT KNOX, KENTUCKY

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES, WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18 U.S.C. SECTIONS 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

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DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

29 DEC 1965

AMSTE-BC

SUBJECT: Reports of Engineering, Service, and Service-Type Tests of
Small Arms Weapons Systems (SAWS) (USATECOM Project Nos.
8-5-0400-03 Through 8-5-0400-06)

TO: Commanding General, US Army Weapons Command, ATTN: AMCPM-RS,
Rock Island, Illinois 61200
Commanding General, US Army Combat Developments Command, ATTN:
USACDC Liaison Officer, USATECOM, Aberdeen Proving Ground,
Maryland 21005

1. References:

a. Headquarters Department of the Army, Chief of Staff Memorandum No. 64-555, 17 Dec 64, subj: Army Small Arms Weapons Systems (Class CONF).

b. Ltr, Hq USAMC (AMCPM-RS), 28 Apr 65, subj: Army Small Arms Weapons Systems (SAWS) (U) (Class CONF).

c. TT, USAWECOM 19371, 15 Dec 65.

2. Forwarded herewith are reports of tests of Army Small Arms Weapons Systems (SAWS) which were conducted by the US Army Test and Evaluation Command in accordance with the requirements of references 1a and 1b.

3. The Report of Engineering Test (Incl 1) is partial because testing is still in progress. A final report of engineering test covering those tests still in progress will be forwarded when available.

4. These reports are forwarded for information and to meet the deadlines established for the SAWS Program. A Headquarters USATECOM position with respect to these reports and their conclusions and recommendations will be provided upon completion of detailed analysis, now in progress; pending completion of this analysis, addressees are cautioned in the use of certain of the data presented for the reasons indicated below.-

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AMSTE-BC

29 DEC 1965

SUBJECT: Reports of Engineering, Service, and Service-Type Tests of
Small Arms Weapons Systems (SAWS) (USATECOM Project Nos.
8-5-0400-03 Through 8-5-0400-06)

a. Tactical Firing Exercises (USA Infantry Board Report).-- The results obtained in tests of this nature are primarily dependent upon human performance; troop samples should be matched in size and quality, and test conditions should be identical for each weapon insofar as possible. However, although every effort was made, it was not possible to maintain optimum controls in SAWS testing due to circumstances that were largely unavoidable and beyond the control of the test agency.

(1) Weapons were not available in uniform quantity, and in some cases were delivered after testing had been initiated, because of contractor inability to meet the desired schedule. In consequence, the size of troop samples varied and in some instances the learning factor could not be kept equal for all weapons.

(2) Delays and suspensions imposed on the test agency for safety considerations and/or because of weapon malfunctioning resulted in some variance in test conditions.

b. Reliability and Durability (Engineering and Service Test Reports).-- Weapons tested varied from some which have been in production for several years to others which are in an early stage of development. Data bearing upon reliability and durability must be carefully analyzed to correlate Engineering and Service Test results and to determine, where possible, whether malperformances are considered to be correctable in future development or reflect basic design deficiencies.

c. Ammunition (Engineering and Service Test Reports).-- In SAWS tests ammunition of "average" quality, representative of that available for issue to troops, was used. In testing it was found that occasional unacceptable wide dispersion was obtained with the 7.62mm M80 ball cartridge, and that the 5.56mm M193 ball cartridge apparently contributed to relatively low functional reliability of some weapons. The degree to which ammunition contributed to these results must be analyzed in detail.

5. This Headquarters, in coordination with the USA Ballistic Research Laboratories, the USA Human Engineering Laboratories, and other agencies, is presently conducting the necessary analysis to determine whether and to what degree, SAWS test results were affected by the factors

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SUBJECT: Reports of Engineering, Service, and Service-Type Tests of
Small Arms Weapons Systems (SAWS) (USATECOM Project Nos.
8-5-0400-03 Through 8-5-0400-06)

enumerated above. It is expected that this analysis will be forwarded on
or before 31 January 1966.

FOR THE COMMANDER:

Austin Triplett Jr.
AUSTIN TRIPLETT, JR.
Colonel GS
Dir, Inf Mat Test

4 incl

1. Proj No. 8-5-0400-03 (APG)
(Partial Report)
2. Proj No. 8-5-0400-04 (USAIB)
3. Proj No. 8-5-0400-05 (USAAB)
4. Proj No. 8-5-0400-06 (USA Avn Test Bd)
(AMCPM-RS, w/5 cys ea incl)
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USATECOM ~~XXXXXXXXXX~~ 8-5-0400-05

(6) SERVICE TEST
OF
SMALL ARMS WEAPONS SYSTEMS (U) (8)

(9) FINAL REPORT, 1 Sep - 15 Nov 65,

(10) ~~XXXXXXXXXX~~ WILLIAM P. FARMER

(11) 13 DEC ~~XXXXXX~~ 1965

(12) 75p.

US ARMY ARMOR BOARD
Fort Knox, Kentucky

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This document has been classified by authority of Memorandum, CS 474 (17 Dec 64), Department of the Army, Office of the Chief of Staff, 17 December 1964, subject: Army Small Arms Weapons Systems, w 2 incl.

For Charles H. Rodger May 1964
BIRTRUN S. KIDWELL, JR.
Major, Armor
Chief, Combat Vehicle Division
9 December 1965

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(C) ABSTRACT (U)

Service Test of the S-C and C-SMG as vehicular-stowed weapons on combat vehicles for local security purposes and other dismounted action was conducted by the US Army Armor Board at Fort Knox, Kentucky during the period 1 September-15 November 1965. The S-C satisfied the test criteria and the C-SMG satisfied it except for excessive muzzle blast and flash. This was classified as a deficiency. Also, the hand guard on the C-SMG chipped (a shortcoming).⁹ It was concluded that both the S-C and the C-SMG offered significant advantages over the current standard caliber .45 Sub-Machine Gun, M3A1 in range, general utility, safety, and handling characteristics for its intended purpose, that the S-C as tested was suitable for US Army use as a combat vehicle-stowed individual weapon and that the C-SMG would be suitable when the deficiency is corrected, and that both the S-C and C-SMG were safe for their intended use. It was recommended that, subject to action by Department of the Army to adopt 5.56mm weapons on a scale for general use by ground troops, the S-C weapon be adopted for US Army use as a vehicle-stowed individual weapon for combat vehicle crew members.

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(U) FOREWORD

1. REFERENCES.

a. US Army Armor Board Plan of Test for Service and Military Potential Tests of Small Arms Weapons Systems (Vehicular Mounted Weapons) USATECOM Project No 8-5-0400-05-H1 (U), 27 May 65.

b. Ltr, STEBB-TA, US Army Armor Board, 9 Jun 65, subject: Change No 1 to Service and Military Potential Test Plan for Small Arms Weapons Systems (Vehicular Mounted Weapons), USATECOM Project No 8-5-0400-05.

c. Ltr, CAGIN-CM, USACDCIA, 11 Mar 65, subject: Characteristics and Standards Against Which to Conduct Engineering/Service Type Tests for Small Arms Weapons Systems (SAWS) Program, w 2 incl.

d. Ltr, AMSTE-EC, HQ USATECOM, 23 Apr 65, subject: Small Arms Weapons Systems (SAWS) Program, w 4 incl.

e. Ltr, AMSTE-EC, HQ USATECOM, 26 Apr 65, subject: Recording of SAWS Weapons Performance Data, w 1 incl.

f. Ltr, STEEC-SA (P-3110), USAIB, 9 Jul 65, subject: Recording of SAWS Weapons Performance Data.

g. Ltr, CAGAR-M, USACDCARMA, 22 Mar 65, subject: Transmittal of USACDC Armor Agency Comments on Characteristics and Standards Against Which to Conduct Engineering/Service Type Tests for Small Arms Weapons Systems (SAWS) Program (U), w 1 incl.

2. AUTHORITY.

a. Ltr, AMSTE-EC, HQ USATECOM, 1 Feb 65, subject: Engineering and Service Test of Small Arms Weapons Systems (SAWS) (USATECOM Project Nos. 8-5-0400-01 thru 8-5-0400-07) (U), w 6 incl.

b. Ltr, AMSTE-EC, HQ USATECOM, 30 Apr 65, subject: Small Arms Weapons Systems (SAWS) Program (U), w 1 incl.

c. Msg, APG 15675, AMSTE-B7, HQ USATECOM, 29 Sep 65, subject: SAWS Program, Final Reports.

d. Msg, APG 17192, AMSTE-BC, HQ USATECOM, 26 Oct 65,
subject: SAWS Program, Stoner Fixed Machine Gun in Coaxial Tank
Role.

e. Msg, 271700Z, AMSTE-BC, HQ USATECOM, 27 Oct 65,
subject: Colt CAR-15 "SHORTIE" Submachine Gun in SAWS Program.

f. Ltr, AMSTE-BC, HQ USATECOM, 1 Nov 65, subject: Small
Arms Weapons Systems (SAWS) Program.

SECTION 1 (C) - GENERAL (U)

1.1 (U) OBJECTIVE

To determine the handling and transportability characteristics and suitability for use of individual weapons designed specifically for combat vehicle crew members.

1.2 (U) RESPONSIBILITIES

US Army Armor Board was responsible for test plan preparation, test execution, and test reporting.

1.3 (U) DESCRIPTION OF MATERIEL

1.3.1

The test weapons were developmental, 5.56mm (.223 caliber), shoulder-fired arms of the carbine/sub-machinegun class for use in the role as vehicular-stowed individual weapons used by the crews of tanks and comparable combat vehicles for local security purposes and other dismounted action.

1.3.2

Brief descriptive data on the test weapon is given below.

1.3.2.1

The S-C is a lightweight, 5.56mm magazine-fed, gas-operated, front-locking, rotary-bolt weapon capable of firing in either semi- or full-automatic mode at a cyclic rate of 660 rounds/minute. It is a closed-bolt type, and has a short barrel assembly and a folding buttstock.

1.3.2.2

The C-SMG is a 5.56mm gas-operated, air-cooled, magazine-fed, semi- or full-automatic shoulder weapon which fires at a rate of 750 rounds/minute. It feeds from a 30-round magazine, fires from a closed bolt, and has a telescoping buttstock. A sling is the only accessory.

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1.4 (C) BACKGROUND (U)

1.4.1

The adoption of the 5.56mm, M16/XM16E1 Rifle for US Air Force use and limited Army use stimulated the interest of industry in developing other weapons in this caliber for military use. In 1963-64, the Advanced Research Projects Agency (ARPA), Department of Defense, directed and coordinated Army and Marine Corps tests of the S-C Weapons System, a family of six 5.56mm weapons which featured interchangeability of components. Army tests were limited to those necessary to determine the military potential of the system, while the Marine Corps conducted service and troop tests. The results of the Army tests indicated that the S-C weapons were accurate and of good basic design, but that the machineguns appeared to be marginal in operating power and deficient in barrel life.

1.4.2

In December 1964, the Chief of Staff, US Army, directed a review and evaluation of small arms weapons systems either in being or feasible for adoption within the time frame 1965-1980. The objective of this program is to develop background upon which to base a program for replenishment of stocks of small arms as the inventory drops below requirements and/or replacement of current small arms with weapons of demonstrated superiority.

1.4.3

This project is one of seven interrelated task assignments which are the responsibility of US Army Test and Evaluation Command under the Department of Army Small Arms Weapons Systems (SAWS) Program.

1.4.3.i

The USATECOM test directive, as amended, delineated to this board the responsibility for service test of individual weapons designed specifically for use by combat vehicle crewmen and for military

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potential tests of competitive machineguns adapted to the tank coaxial machinegun role together with mountings therefor (paragraphs 2a and b, Foreword). The plan of test (reference 1a, Foreword) was prepared on this basis.

1.4.3.2

Subsequently, that phase of the project having to do with military potential testing of weapons in the tank coaxial machinegun role by this board was terminated (paragraphs 2d and f, Foreword). Three S-FMG weapons were delivered to this board in July 1965, followed by mounting kits for M60 series tanks in September. However, design of the coaxial mount(s) failed to consider the turret nylon ballistic shield and it was impossible to mount the machineguns. This fact together with the nonavailability of the C-FMG weapon prompted USATECOM action to terminate this portion of the Armor Board project. Exclusive responsibility for completion of coaxial machinegun testing was assigned to Aberdeen Proving Ground.

1.4.4

In July 1965, five S-C and five C-SMG weapons together with supporting ammunition were delivered to this board. Following design and fabrication of suitable mounts for stowing the candidate weapons in M60 series tanks, testing was initiated in September 1965.

1.5 (C) FINDINGS (U)

1.5.1

The S-C weapon satisfied applicable portions of characteristics and standards furnished as test criteria. (See appendix II.)

1.5.2

The C-SMG weapon satisfied applicable portions of characteristics and standards furnished as test criteria (appendix II) except for excessive muzzle flash and blast. (This is a deficiency. See paragraphs 2.4.3.5 and 2.5.3.2 and paragraph 1, appendix III.)

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1.5.3

One shortcoming was reported when the hand guard on two C-SMG weapons chipped at the junction with the hand guard cap. (See paragraph 2, appendix III.)

1.5.4

Based upon all testing, the overall relative standing of test, control, and comparison weapons follows:

- a. S-C
- b. C-SMG
- c. M14E1 rifle
- d. M3A1 sub-machinegun.

1.5.5

Test operations indicated that a 30-round magazine is the optimum size for ease of handling, stowage, and combat effectiveness for vehicular-stowed weapons on combat vehicles.

1.5.6

Safety Confirmation. No safety hazards were encountered with the test weapons.

1.6 (C) CONCLUSIONS (U)

The US Army Armor Board concludes that:

1.6.1

Both the 5.56mm S-C and the 5.56mm C-SMG offer significant advantages over the current standard Caliber .45 Sub-Machine Gun, M3A1 in range of effectiveness, general utility, safety, and handling characteristics when employed by crew members of combat vehicles in the role of local security and dismounted action.

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1.6.2

Except for effective range, the S-C and C-SMG have the above advantages over the M14E1 rifle.

1.6.3

The S-C is suitable as tested for US Army use as a combat vehicle stowed individual weapon.

1.6.4

The C-SMG will be suitable for US Army use as a combat vehicle-stowed individual weapon with the correction of the deficiency listed in appendix III.

1.6.5

The S-C and the C-SMG as tested, are safe for their intended use.

1.7 (C) RECOMMENDATION (U)

The US Army Armor Board recommends that in the event the Department of the Army adopts the 5.56mm weapons on a scale for general use by ground troops, the S-C be adopted for US Army use as vehicle stowed individual weapon for combat vehicle crew members.

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SECTION 2 (C) - DETAILS OF TEST (U)

2.0 (U) INTRODUCTION

2.0.1

Tests were conducted by the Combat Vehicle Division of the US Army Armor Board at Fort Knox, Kentucky during the period 1 September-15 November 1965 utilizing the plan of test referenced in paragraph 1a, Foreword, with change, reference 1b, Foreword, and as amended by authority of message and letter, paragraphs 2d and 2f, respectively, Foreword.

2.0.2

The standard Caliber .45 Sub-Machine Gun, M3A1 served as the control weapon. The development type 7.62mm Rifle, M14E1 (Type III) was used for comparison with the candidate weapons.

2.0.3

Tests were designed to satisfy the requirements of US Army Combat Developments Command in terms of applicable characteristics and standards provided under the SAWS program (reference 1c, Foreword, with interpretation and delineation of test responsibilities by HQ USATECOM, reference 1d, Foreword).

2.0.4

Recording of performance data was in accordance with instructions in references 1e and 1f, Foreword.

2.0.5

Service test facilities, methods, and procedures were used throughout.

2.0.6

M60 series tanks operating on concurrent test programs were used as facility vehicles in conjunction with tests contained in paragraphs 2.2, 2.4, 2.7, and 2.8.

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2.0.7

In accordance with instructions contained in letter, paragraph 2b, Foreword, the analysis paragraph of each applicable sub-test contains an order of preference which reflects the relative standing of test, control, and comparison weapons.

2.1 (C) PREOPERATIONAL INSPECTION AND PHYSICAL CHARACTERISTICS (U)

2.1.1 (C) OBJECTIVE (U)

2.1.1.1

To ensure that the test items as received at Fort Knox were in proper condition for test operations.

2.1.1.2

To record and compare the physical characteristics of the test items with those of the control and comparison weapons.

2.1.1.3

To verify the type, the method of functioning, and the operational readiness, as appropriate of basic features of each candidate weapon class and of associated elements of the complete weapons system.

2.1.1.4 (C) Criteria (U)

2.1.1.4.1 Simplicity in Design and Construction maximum permitted by other required characteristics. (See para 3a(1), appendix II.)

2.1.1.4.2 Weight - minimum permitted by other required characteristics. (See para 3a(2), appendix II.)

2.1.1.4.3 Length - minimum permitted by other required characteristics; three-point support (chest and elbows) when firer is in the prone position desirable. (See para 3a(3), appendix II.)

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2.1.1.4.4 Safety(s) - easily identifiable, conveniently located, positive safety(s) to prevent accidental firing and dangerous malfunctions; designed so that safe-fire position can be determined by touch and operation of safety(s) is inaudible. (See para 3a(4), appendix II.)

2.1.1.4.5 Sights - simple and durable integral sight(s) having positive settings and appropriate visual scales for determining "zero" and not requiring use of special tools for adjustment. (See para 3a(5)(a), appendix II.)

2.1.1.4.6 Magazine Ammunition Capacity - maximum permitted by other required characteristics. Determine suitability of magazines with minimum of 50 rounds point-fire ammunition. Evaluate suitability of magazines of lesser and greater capacities and use of factory packed, expendable (discardable) magazines. Determine capability of loading the weapon (insertion of magazine) in one operation (from all firing positions). (See para 3a(6), appendix II.)

2.1.2 (U) METHOD

2.1.2.1

The test items were subjected to technical inspection upon receipt.

2.1.2.2

The test items were weighed, measured, and photographed. The physical characteristics of the test items were recorded and compared to those of control and comparison weapons.

2.1.2.3

Basic features of the respective weapon types and the associated elements of the complete weapons system, as follows, were checked to determine type, method of functioning, and operational readiness, as appropriate.

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2.1.2.3.1 **Integral safety features, both self-functioning and selectively-applied types.**

2.1.2.3.2 **The integral sight system of individual weapons to include adjustments for zeroing and increments of range covered.**

2.1.2.3.3 **Magazines for individual weapons.**

2.1.3 **(U) RESULTS**

2.1.3.1

All test, control, and comparison weapons arrived in proper condition for test operations and functioned properly during technical inspection.

2.1.3.2

Physical characteristics of the test, control, and comparison weapons are given in paragraph 1, appendix I, Test Data. For a photograph of the test, control, and comparison weapons see page IV-1. All weapons were simple in design and permitted three-point support when firer was in prone position.

2.1.3.3

The S-C, the C-SMG, and the M14E1 Rifle had manual safety devices which were easily identifiable, conveniently located, and positive. Safe and Fire positions could be determined by feel in all three weapons; and operation was inaudible. The M3A1 SMG was safe (when loaded) only when the cover was closed.

2.1.3.4

The S-C and the C-SMG had similar sighting arrangements. Both were adjustable in elevation by raising or lowering the front blade using the tip of a cartridge. Windage corrections were applied by moving the rear peep to either side. Both test weapons had "L" type rear sights with selections for 300 or 500 meters. The M14E1 had a rear sight adjustable in elevation and

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windage. Major range adjustments were made by raising or lowering the rear sight. The sights on the M3A1 SMG were not adjustable. Individual range increments other than those integral with the 300-/500-meter "L" type rear sight were not provided on the test weapons; however, click-detent positions provided in adjustment of the front blade (post) permit zero settings to be made and identified for zeroing record. Windage (deflection) adjustment provisions include a visual scale.

2.1.3.5

No magazines other than the 30-round capacity types were provided for the test weapons. These magazines were easily loaded into respective test weapons in one operation from all firing positions, mounted and dismounted.

<u>WEAPON</u>	<u>MAGAZINE MATERIAL</u>	<u>CAPACITY</u>
S-C	Steel	30 rd
C-SMG	Aluminum	30 rd
M3A1 SMG	Steel	30 rd
M14E1 Rifle	Steel	20 rd

2.1.3.6

Both types of test weapons had a selector lever for selecting either semi- or full-automatic method of fire.

2.1.4 (C) ANALYSIS (U)

2.1.4.1

Test criteria in paragraph 2.1.1.4 above, were met by both test items. (See paragraph 3a, appendix II.) Test operations indicated that a 30-round magazine is the optimum size for ease of handling, stowage, and combat effectiveness for vehicular stowed weapons on combat vehicles.

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2.1.4.2

Due to its smaller size and light weight, the C-SMG possessed the most desirable physical characteristics.

2.1.4.3

Relative standing is C-SMG, S-C, M3A1 SMG, and M14E1 rifle.

2.2 (C) COMPATIBILITY WITH RELATED EQUIPMENT (U)

2.2.1 (C) OBJECTIVE (U)

2.2.1.1

To determine any modifications necessary, and the time, tools and echelon of maintenance required to install and/or stow the test items on appropriate vehicles.

2.2.1.2

To determine whether or not the test items as installed or stowed were compatible with access to and normal functioning of other components.

2.2.1.3 (C) Criterion (U)

Versatility. Determine . . . suitability for use in those roles in which compactness is essential; and maximum commonality of internal functional parts and ammunition with other weapons of the small arms weapons family. (See para 2, appendix II.)

2.2.2 (U) METHOD

2.2.2.1

Suitable stowage brackets for securing the candidate S-C and C-SMG weapons were installed in an M60 series tank and a determination made of any interferences which these weapons imposed on access to or the functioning of other components.

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2.2.2.2

Time, tools, and echelon of maintenance required to provide stowage facilities for the test individual arms were recorded. Modifications necessary for compatibility were noted.

2.2.2.3

Stowing, removal, and handling characteristics as related to need for compactness were observed and recorded.

2.2.2 (U) RESULTS

2.2.3.1

Standard brackets in the M60 series tank for stowing the M3A1 SMG would not accommodate either of the test weapons. The stowage brackets at the loader's position and the driver's position were easily modified to accept both test weapons. (See photographs, pages IV-4, IV-5, IV-6, IV-7, and IV-10.) However, the stowage of either test weapon at the driver's position interfered with headlight stowage (required when fording). Satisfactory stowage of either test weapon at the loader's position was limited by interference caused by main armament ammunition stowage. When either HEAT or HEP rounds are positioned in the vertical ready rack immediately adjacent to the mounting bracket, the weapon cannot be withdrawn without first releasing the main armament round(s) physically blocking its rearward movement. (See photograph, page IV-5.)

2.2.3.2

Two S-C weapons were satisfactorily stowed in an M60A1 tank in stowage brackets fabricated locally. Photograph, page IV-7, shows an S-C satisfactorily stowed at the driver's position and the drawing on page I-7 shows a similar weapon relocated and satisfactorily stowed in the vicinity of the turret bustle horizontal ammunition rack. Sixteen man-hours were required for direct support maintenance to fabricate and install these brackets.

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2.2.3.3

The compact and uncluttered design of both test weapons contributed to relative ease in stowing, in rapid removal (withdrawal), and handling within the confinement of a combat vehicle.

2.2.4 (U) ANALYSIS

2.2.4.1

Configuration and dimensional characteristics of the test weapons are such that both weapons meet the requirement for compatibility with related equipment. Fabrication and installation of adequate stowage brackets is not a significant problem; however, improved stowage locations should be the subject of further investigation. Interchangeability and commonality of parts was not determined since the coaxial machinegun phase of this test involving other weapons in the S-C and C-SMG small arms systems was cancelled. (See paragraph 2, appendix II.)

2.2.4.2

Relative standing is C-SMG, S-C, M3A1, and M14E1.

2.3 (U-FOUO) KNOWN DISTANCE FIRING

2.3.1 OBJECTIVE

To determine performance of the test individual weapons under known distance range firing conditions.

2.3.2 METHOD

2.3.2.1

Representative tank crewmen fired the test and control weapons for familiarization, instruction, and record using the courses and tables prescribed in Section III, Chapter 4, Marksmanship Training, FM23-41, Sub-machine Guns, Caliber .45, M3 and M3A1, June 1957.

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2.3.2.2

Preparatory marksmanship training was given all participating tank crewmen in accordance with Section II, Chapter 4, FM 23-41.

2.3.2.3

Scores were recorded on individual score cards. Records were made of difficulties experienced by firing personnel. Pertinent comparisons were made between the test and control weapons in terms of handling characteristics, scoring, and overall performance in known distance firing.

2.3.2.4

Limited firing was conducted at known distances of 100, 200, 300, 350, and 400 meters range.

2.3.3 RESULTS

2.3.3.1

The tabulation below reflects results of the record qualification course as fired by seven trained tank crewmen.

SCORES

<u>FIRER</u>	<u>S-C</u>	<u>C-SMG</u>	<u>M3A1</u>	<u>M14E1</u>
1	205	195	196	
2	158	161	154	172
3	160	162	140	
4	158	136	186	132
5	195	164	179	
6	153	183	178	175
7	183	171	184	
TOTAL	1,212	1,172	1,217	479
AVG	173.1	167.4	173.9	159.7

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2.3.3.2

Both test weapons, properly zeroed, afforded good hitting characteristics out to 300 meters range (average - 28 hits in 30 rounds). A trained soldier consistently hit a kneeling silhouette ("E" type) target firing from a position that permitted accurate aim; that is, from an expedient rest. At 350 meters, hitting characteristics became marginal (15 hits in 30 rounds) and, at 400 meters, both weapons were generally ineffective (8 hits in 30 rounds) in hitting man-size targets represented by "E" type silhouettes.

2.3.4 ANALYSIS

2.3.4.1

The scores in para 2.3.3 above should be considered with the following facts in mind:

2.3.4.1.1 The qualification course fired was designed for the M3 class sub-machinegun which has a significantly lower rate of fire than any of the other weapons.

2.3.4.1.2 The maximum range to any target was 60 yards with 30 yards as the average range.

2.3.4.1.3 The ability of the firer to achieve a high score was related to his ability to adjust to the size, weight, and ability to control burst size of the weapons.

2.3.4.2

Both of the test weapons were preferred by all firers to either the M3A1 or the M14E1 because both were significantly more accurate than the M3A1 at ranges greater than 50 meters and both were much easier to handle than the M14E1.

2.3.4.3

Both test weapons are considered satisfactory and desirable with respect to accuracy and hitting characteristics. However, indications from this firing are that effective employment of either test weapon for point-fire at a range greater than 300 meters is questionable.

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2.3.4.4

Relative standing is S-C, C-SMG, M3A1 SMG, and M14E1 rifle.

2.4 (C) FUNCTIONAL SUITABILITY (U)

2.4.1 (C) OBJECTIVE (U)

2.4.1.1

To evaluate significant design features, operating characteristics, and performance limitations affecting functional suitability of test weapons in specified roles.

2.4.1.2 (C) Criteria (U)

2.4.1.2.1 Versatility. Determine the capability of delivering selectively, both semiautomatic, full automatic and/or controlled burst automatic fire; . . . weapons family. (Recommended by USACDCARMA: Determine whether or not the configuration on individual candidate systems permits rapid exit and entry of crew members from the tank while armed with the auxiliary weapon.) (See para 2, appendix II.)

2.4.1.2.2 Rate of Fire - Determine effect of full automatic mode cyclic rate of fire on accuracy and ability of firer to control size of his bursts when firing from shoulder, hip, and 3-point support on the ground. (See para 4, appendix II.)

2.4.1.2.3 Firer Exposure - exposure related to weapon configuration when firing from a tank or combat vehicle hatch or from positions on the ground adjacent to the tank. (See para 6a, appendix II.)

2.4.1.2.4 "Soldier Proof" Features - such as tamper-proof controls, reversed assembly, firing without cleaning or lubricating, use of improper cleaning materials (gas, diesel fuel, etc.) and ruggedness. (See para 6b, appendix II.)

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2.4.2 (U) METHOD

2.4.2.1

Throughout all phases of testing, weapons were observed, checked, and analyzed in terms of functional suitability.

2.4.2.2

Specific analysis was made of design features, operating characteristics, and performance limitations of all weapon types. A record was made of factors contributing to effectiveness in a tactical environment.

2.4.2.3

Limitations in handling and relative effectiveness in obtaining target hits with the vehicular-stowed, individual weapons was determined and pertinent observations recorded.

2.4.2.4

Simulating use in mounted local security situations and in city and village street fighting, the test weapons were used to engage targets from the open-hatch position at the tank commander's and loader's stations. Firing was conducted with the vehicle moving.

2.4.2.5

Items to be verified included the following as applicable to the respective weapon classes:

2.4.2.5.1 Signature effects associated with smoke, flash, and blast.

2.4.2.5.2 Special design features such as tamper-proof controls, interrelationship of parts to prevent reversed assembly, and capability to continue functioning for long periods without cleaning or lubrication.

2.4.2.5.3 Rates of fire; relationship of burst size to hitting effectiveness; and effects of adverse weather or operating conditions.

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2.4.3 (U-FOUO) RESULTS

2.4.3.1

Both test weapons and the M14E1 delivered selectively semi-automatic fire and full automatic fire and controlled burst (3 to 5 rounds) automatic fire. The M3A1 delivered full-automatic fire and controlled burst automatic fire but did not provide a semi-automatic selection. The test weapons and the M3A1 permitted rapid entry into and exit from the tank. The M14E1 was awkward to handle during entry and exit and while firing from the commander's and loader's hatches due to its weight and size. No problems were encountered while firing the test weapons or the M3A1 from these hatches with the tank stationary or moving.

2.4.3.2

The most effective full automatic rate of fire for the test weapons was 3 to 5 round bursts.

2.4.3.3

Firer exposure for all weapons was the same.

2.4.3.4

Both types of test weapons were capable of firing without maintenance after exposure to the elements (rain, dust, etc.) for 3 days. All stoppages caused by dirt were clearable by immediate action (CBIA). Controls on test weapons were tamper proof and reverse assembly was not possible.

2.4.3.5

The C-SMG exhibited excessive flash and blast. (See photo, page IV-2 and IV-3 and para 2.5.3.2.)

2.4.4 (C) ANALYSIS (U)

2.4.4.1

The signature and position disclosing effects caused by the flash and blast in the C-SMG are considered a deficiency. The S-C when firing the same lot of ammunition has negligible position

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disclosing effects. (See photographs on pages IV-2 and IV-9.) Although a different lot (RA 5072) of ammunition received late in the test reduced this effect in the C-SMG, it was still easier to locate during darkness than the S-C. (See photograph, pages IV-3 and IV-9.)

2.4.4.2

Criteria specified in paragraph 2.4.1.2 above, were met satisfactorily including design features contributing to soldier acceptance and overall functional suitability. (See paragraphs 2, 4, and 6a and 6b, appendix II.)

2.4.4.3

Relative standing is S-C, C-SMG, M3A1, and M14E1.

2.5 (U-FOUO) AMMUNITION FUNCTIONING

2.5.1 OBJECTIVE

To determine if various ammunition types provided for use with the test weapons functioned satisfactorily.

2.5.2 METHOD

2.5.2.1

Ammunition was observed for proper functioning during all firing tests.

2.5.2.2

Critical observation of flash and smoke was made and recorded.

2.5.2.3

Improper functioning was recorded together with pertinent details and conditions.

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2.5.3 RESULTS

2.5.3.1

Fourteen stoppages, all clearable by immediate action, occurred in the firing of 4,042 rounds (para 2, appendix I). Four were caused by a dirty S-C gun which was transported 300 miles cross-country in an M60A1 tank in 3 days. (See paragraph 4, appendix I, for detailed data on stoppages.) Four stoppages occurred in C-SMG (SN014643) because the weapon failed to cock. In S-C weapons three rounds (Lot WCC 6089) with normal primer indentations failed to fire for reasons unknown and three rounds failed to fire due to light strikes on the primer.

2.5.3.2

Lot WCC 6089 produced excessive flash and blast (noise) when fired from the C-SMG. Lot RA 5072 ammunition reduced the flash associated with the C-SMG but excessive blast (noise) was not noticeably reduced. (See photographs, pages IV-2 and IV-3, and para 1, appendix III.)

2.5.3.3

No stoppages occurred in control or comparison weapons.

2.5.4 ANALYSIS

2.5.4.1

Muzzle flash and blast produced by firing the C-SMG is considered to be excessive and resulted in a distinct signature effect not associated with the S-C.

2.5.4.2

Relative standing is M3A1, M14E1, C-SMG, and S-C.

2.6 (U-FOUO) WEAPONS FUNCTIONING

2.6.1 OBJECTIVE

To determine whether the test weapons functioned satisfactorily.

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2.6.2 METHOD

2.6.2.1

Weapons were observed for proper functioning during all firing tests.

2.6.2.2

Improper functioning was recorded together with pertinent conditions and details.

2.6.3 RESULTS

Fourteen stoppages, all clearable by immediate action, occurred in 4,042 rounds (para 2, appendix I). Four of these occurred in an S-C which had been exposed to rain and dust for 3 days. Four occurred when a C-SMG failed to cock. Three occurred in two S-C weapons which failed to fire for reasons unknown (primer indentation was normal - Lot WCC 6089) and three rounds, one each from three different S-C weapons, failed to fire due to light strikes on the primer. Detailed data on stoppages are in para 3 and 4, appendix I. There were no stoppages in the control and comparison weapons.

2.6.4 ANALYSIS

Relative standing is M3A1, M14E1, C-SMG, and S-C.

2.7 (U-FOUO) COMPONENT STOWAGE

2.7.1 OBJECTIVE

To determine the adequacy of stowage provisions for the test individual weapons.

2.7.2 METHOD

2.7.2.1

The test individual weapons were stowed in an M50 series tank. Their disposition and general condition were noted and recorded throughout the course of testing.

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2.7.2.2

Adequacy of stowage provisions were judged on the basis of difficulties encountered in adapting the test materiel to such provisions and on the basis of protection afforded. Significant problem areas were noted and recorded.

2.7.3 RESULTS

2.7.3.1

See paragraph 2.2.3.1 and 2.2.3.2.

2.7.3.2

Of the 14 stoppages (in 4,042 total rounds) in the test weapons, 13 occurred in weapons that had been transported 1,000 miles in an M60A1 tank. Nine of these occurred in 2 S-C weapons (1,176 rounds) and 4 in a single C-SMG (204 rounds). (See para 3, appendix I.)

2.7.4 ANALYSIS

2.7.4.1

Fabrication and installation of adequate stowage brackets is not a significant problem area.

2.7.4.2

Relative standing is M3A1, C-SMG, S-C, and M14E1.

2.8 (C) DURABILITY AND RELIABILITY (U)

2.8.1 (C) OBJECTIVE (U)

2.8.1.1

To determine whether the test items were durable and reliable.

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2.8.1.2 (C) Criteria (U)

2.8.1.2.1 Malfunctions - Determine (to include failures to feed or fire) in terms of number of rounds fired and categorized as: clearable by immediate action; and requiring parts replacement or correction by echelons higher than the individual using the weapon. (See para 5a, appendix II.)

2.8.1.2.2 Ruggedness - Determine capability to withstand normal usage encountered in training and combat and of functioning for long periods without cleaning or lubrication. (See para 5b, appendix II.)

2.8.2 (U) METHOD

Two each of the S-C and C-SMG weapons were stowed in an M60 series tank for durability operation. Each tank was operated for 1,000 miles under representative automotive test conditions including dust, mud, and adverse weather. Weapons were checked daily to verify their general condition and to re-secure them in the stowage brackets provided for this purpose. A firing check was made to verify proper functioning at the beginning of the test, at approximately 500 miles of operation and at the conclusion of 1,000 miles. Pertinent observations were recorded.

2.8.3 (U-FOUO) RESULTS

2.8.3.1

Of the 14 stoppages (in 4,042 rounds) in the test weapons, 13 occurred in weapons that had been transported 1,000 miles in an M60A1 tank. Nine of these occurred in 2 S-C carbines (1,176 rounds). Of these nine, 4 occurred in a weapon which had been stowed at the driver's station, and not maintained for the last 300 miles of durability. It was exposed to severe dust, rain, and dew. The remaining four stoppages occurred in a single C-SMG (240 rounds). All stoppages were clearable by immediate action. Details of stoppages are shown in paragraph 3, appendix I.

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2.8.3.2

All weapons functioned normally during daily inspections and fired normally after 500 miles except for C-SMG (SN 014643) which failed to cock 4 times (in 52 rounds) during the 500-mile check firing, and S-C (SN 000444) which failed to fire once (in 45 rounds) due to a light primer strike during the 500-mile firing check.

2.8.3.3

On the C-SMG, the hand guard (FSN 1005-056-2252) was difficult to remove from and install under the hand guard cap (FSN 1005-979-3924). Two complete hand guards (right and left) on two weapons were damaged while cleaning the weapons. (See photograph, page IV-8.) This had no effect on operation of weapon. (See para 2, appendix III.)

2.8.3.4

Except as noted above, there were no parts damaged or broken on the test weapons during test operations.

2.8.4 (U-FOUO) ANALYSIS

2.8.4.1

The test weapons are considered to be reliable and durable and to have met the test criteria specified in paragraph 2.8.1.2, above. (See paragraphs 5a and 5b, appendix II.)

2.8.4.2

Relative standing is M3A1, M14E1, C-SMG, and S-C.

2.9 (C) MAINTENANCE (U)

2.9.1 (C) OBJECTIVE (U)

2.9.1.1

To determine whether organizational maintenance of the test item could be accomplished readily.

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2.9.1.2

To check the adequacy of on-vehicle and organizational tools and to verify the requirements for special tool and equipment sets.

2.9.1.3

To review the equipment publications.

2.9.1.4

To accumulate repair parts usage data.

2.9.1.5

To accumulate data pertaining to man-hours expended in maintenance.

2.9.1.6 (C) Criteria (U)

2.9.1.6.1 Ease of Assembly and Disassembly - ease of assembly and disassembly; and tools required. (See para 7a, appendix II.)

2.9.1.6.2 Ease of Maintenance - under combat conditions. (See para 7b, appendix II.)

2.9.1.6.3 Design - precluding reversed assembly which adversely affects weapon functioning (to include barrel change if appropriate). (See para 7c, appendix II.)

2.9.2 (U) METHOD

2.9.2.1

All authorized organizational maintenance was performed to determine the feasibility and ease of performing each operation at the level prescribed in the maintenance allocation chart.

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2.9.2.2

Tools from the company armorer's tool set were used for all organizational maintenance. (Tools for crew and organizational maintenance, and components of special tool and equipment sets for performance of organizational maintenance of test weapons were not provided.)

2.9.2.3

The equipment publications were checked for accuracy and adequacy

2.9.2.4

No repair parts were received.

2.9.2.5

Man-hours required to clean all weapons were recorded.

2.9.2.6

Pertinent observations regarding ease of disassembly-assembly and of maintenance generally, under simulated combat conditions, were recorded. Any occurrence of reversed assembly with consequent adverse effects or the potential of such occurrence was noted.

2.9.3 (U-FOUO) RESULTS

2.9.3.1

The following Preliminary Operating and Maintenance Manuals (POMM) and Technical Manual (TM) were furnished with the test weapons and were considered adequate for operation and organizational maintenance.

2.9.3.1.1 POMM 9-1055-268-12 (5.56mm S-C)

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2.9.3.1.2 POMM 9-1005-272-12 (5.56mm, C-SMG)

2.9.3.1.3 TM 9-1005-249-14, Operation, Maintenance, Repair and Replacement Parts, Rifle, 5.56-mm, M16 and Rifle, 5.56-mm, XM16E1 w/c 2 dated 1 Mar 65.

2.9.3.2

Disassembly, assembly and all organizational maintenance tasks were performed without difficulty. Reverse assembly was not possible. (See para 2.4.3.4.)

2.9.3.3

Under simulated combat conditions, the average times for two firers to clean the test, control, and comparison weapons after firing were:

	C-SMG	S-C	M3A1	M14E1
Complete detailed cleaning	45	39	25	50 min
Field cleaning	30	20	8	25 min

2.9.3.3

No maintenance or repair other than normal operator cleaning was required on any of the weapons.

2.9.3.4

Organizational Maintenance repair parts and special tools for either type test weapon were not furnished and could not be evaluated. Tools from the company armorer's tool set were satisfactory for all allotted maintenance tasks.

2.9.3.5

Special cleaning equipment for the C-SMG as listed in Chapter IX, TM 9-1005-249-14, Change 2, was not furnished but

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cleaning equipment for the S-C shown in Figure 31, POMM 9-1005-268-12 was provided and was adequate for cleaning both weapons.

2.9.3.6

The hand guard was difficult to remove from the C-SMG.

2.9.4 (U-FOUO) ANALYSIS

2.9.4.1

Both types of test weapons were easy to maintain and clean; however, the S-C was easier to clean after firing because the forward location of the piston keeps the receiver area cleaner. The proximity of the C-SMG piston allows for a large carbon buildup on the bolt.

2.9.4.2

Both test weapons, despite limitations noted, are considered to satisfy criteria prescribed in paragraph 2.9.1.6, above. (See paragraphs 7a, b, and c, appendix II.)

2.9.4.3

Relative standing is M3A1, S-C, C-SMG, and M14E1.

2.10 (C) HUMAN FACTORS ENGINEERING (U)

2.10.1 (C) OBJECTIVE (U)

2.10.1.1

To determine whether the test weapons were suitable with respect to safety and were compatible with the skills, aptitudes, and limitations of personnel who will operate and service them.

2.10.1.2 (C) Criteria (U)

2.10.1.2.1 Size and Shape - Determine capability of being fired from either the right or left shoulder in all normal firing

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positions by all military personnel meeting physical requirements of Department of the Army. Evaluate suitable stock designs to include use of pistol grip and adjustable stock lengths to accommodate firers of various physical conformation and improve weapon effectiveness. (See para 3b(1), appendix II.)

2.10.1.2.2 **Safetys, Controls, Sights** - minimum number and designed so that they are easily located and identified by touch and operated with minimum motion by the firer. (See para 3b(2), appendix II.)

2.10.1.2.3 **Recoil** - minimum to permit shoulder and hip firing point-fire. (See para 3b(3), appendix II.)

2.10.1.2.4 **Blast and Noise** - Determine undue discomfort to the firer, effects on accuracy and evaluate against maximum level precluding injury. (See para 3b(4), appendix II.)

2.10.1.2.5 **Portability** - Determine relative comfort to carry and fire, to include projections which can readily entangle in brush, grass, or battlefield obstacles. Evaluate suitability of accepting a carrying sling in a conventional manner. Determine suitability of being carried while getting in and out of tanks and other combat vehicles. (See para 3b(5), appendix II.)

2.10.1.2.6 **Pointing Characteristics** - Evaluate configuration, sight design, and balance of the weapon as they affect pointing characteristics. (See para 3b(6), appendix II.)

2.10.1.2.7 **Heat** - Determine effects on firer, weapon's performance, and safety caused by rapid or sustained firing. (See para 3b(7), appendix II.)

2.10.2 (U) METHOD

2.10.2.1

Throughout all testing, observations were made with respect to and crew members were instructed to report difficulties experienced in handling or stowing the test items; discomforts

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suffered by the crew and/or safety hazards encountered; and areas where improvements might be made. When considered necessary, questionnaires and/or interviews concerning phases of use of the test items were completed by test personnel after appropriate intervals of test operation. The safety confirmation required by USATECOM Regulation No 385-7 was considered.

2.10.2.2

Specific observations and both firing and nonfiring trials related to criteria, paragraph 2.10.1.2, above, were made and results recorded.

2.10.3 (U-FOUO) RESULTS

2.10.3.1

Both types of test weapons were easily fired by left or right handed firers in all normal firing positions. The folding stock of the S-C and the telescoping stock of the C-SMG, both nonadjustable in length, appeared to accommodate firers of varied stature equally well. The pistol grip on both weapons proved to be a distinct aid in handling, especially inside the tank, in firing from an open hatch, and in going into dismounted action.

2.10.3.2

Safetys, controls, and sights on both test weapons were easily located, identified, and operated with minimum motion by the soldier-firer.

2.10.3.3

Recoil was insignificant and had no adverse effect on delivery of point fire from shoulder or hip-firing positions.

2.10.3.4

Blast and flash from the C-SMG had adverse effects on the firer. (See para 2.4.4.1 and 2.5.3.2.) The S-C produced no objectionable effects in this respect. (See para 1, appendix III.)

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2.10.3.5

Both types of test weapons were preferable to either the control or comparison weapons for tank crewmen due to their ease in all-around handling their light weight, the light weight of the ammunition and ability to carry more ammunition. Magazine loading was easy on test and comparison weapons, but was difficult and slower on the M3A1. The sling provided for both weapons contributed to portability and was a distinct aid in positioning the weapon for immediate use while standing security guard.

2.10.3.6

Pointing characteristics of the two test weapons are basically the same but the lighter weight of the C-SMG affords some advantage in handling. Configuration, sight design, and balance are about equally good.

2.10.3.7

No unusual problem in respect to effects of heat on the soldier-firer performance of the weapon, or safety were disclosed by the firing conducted under tests. paragraphs 2.3 and 2.4.

2.10.3.8

No safety hazards were encountered.

2.10.4 (C) ANALYSIS (U)

2.10.4.1

Except as noted in paragraph 2.10.3.4, above, pertaining to excessive flash and blast (noise) produced by the C-SMG, both types of test weapons satisfied the test criteria with respect to human factors engineering. (See para 3b(1) through (7), appendix II.)

2.10.4.2

Relative standing is S-C C-SMG. M3A1, and M14E1.

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2.11 (C) TRAINING (U)

2.11.1 (C) OBJECTIVE (U)

2.11.1.1

To determine the adequacy of current military occupational specialties (MOS) with respect to the operation and maintenance of the candidate small arms weapon systems.

2.11.1.2

To evaluate training implications of the candidate weapon types, by class, and to develop insight into the impact of their possible adoption as standard in respect to training requirements and techniques.

2.11.1.3 (C) Criteria (U)

Training Aids. Determine availability and suitability of training aids such as blank ammunition and blank firing attachments/devices, weapon instructional manuals and compatibility with current standard marksmanship training aids. (See para 8, appendix II.)

2.11.2 (U) METHOD

2.11.2.1

Throughout all testing, operation and maintenance procedures carried out by test personnel on the test weapons were evaluated against the skills and knowledge required by military occupational specialty numbers assigned to the organizations expected to receive these test weapons.

2.11.2.2

Training implications were evaluated and analyzed from the standpoint of requirements for tank crewman qualification and from the standpoint of training company armorers.

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2.11.2.3

Mechanical training, preparatory marksmanship training, and known distance firing, as appropriate, was conducted in accordance with provisions of FM 23-41. Representative firing with control weapons was conducted concurrently. Comparisons of test and control weapons in all pertinent aspects was made and recorded.

2.11.3 (U-FOUO) RESULTS

2.11.3.1

No training unusual problems were encountered in training typical tank crewmen to safely fire and maintain the test weapons.

2.11.3.2

With respect to marksmanship training, FM23-41, Sub-machine Guns Caliber .45 M3 and M3A1. July 1957 is inadequate because both test weapons

- a. Fire both semi- and full-automatically
- b. Fire at a higher cyclic rate than the M3 and M3A1
- c. Are effective to at least 300 meters compared to 100 yards for the M3 class sub-machinegun.

2.11.3.3

Preliminary operating and maintenance manuals are adequate to train tank crewmen and company armorers to disassemble, assemble, fire and maintain the test weapons.

2.11.3.4

Training aids, blank ammunition, and blank firing adaptors were not furnished.

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2.11.4 (U) ANALYSIS

2.11.4.1

Training tank crewmen to fire and maintain the test weapons should present fewer problems than training them to fire and maintain current standard weapons, should an entire family of weapons be adopted.

2.11.4.2

Determinations regarding availability of training aids, blank ammunition, and blank firing adapters must be deferred until a later phase in development of the test weapons systems. (See paragraph 8, appendix II.)

2.11.4.3

Relative standing is S-C, C-^SMG, M14E1, and M3A1.

APPENDIX I (U) - TEST DATA

1. Physical Measurements of Test, Control, and Accessory Equipment.

	(Test) C-SMG	(Test) S-C	(Comparison) M14E1 Rifle	(Control) M3A1 SMG
Length, Overall				
Stock Extended	32 1/16"			29 3/4"
Stock Closed	27 3/8"			23 3/16"
Stock Unfolded		36 1/2"	44 11/16"	
Stock Folded		26 3/4"	34 1/2"	
Width, Overall				
Stock Unfolded	2 5/8"	2 1/2"		1 15/16"
Stock Folded		3 5/16"		
Bipod Unfolded			20 1/8"	
Bipod Folded			4 13/16"	
Height, Overall				
With Magazine	10 1/8"	9 7/8"		12 1/8"
Without Magazine	8 3/4"	8"		7 5/8"
Bipod Folded			7 1/2"	
Weight				
Bayonet, Sling, Empty Magazine		9 1/2 lb		
Sling, Empty Magazine	6 1/2 lb		17 1/2 lb	8 3/4 lb
Sling		8 1/2 lb	11 lb	6 lb

2. Ammunition Fired.

a. Total Rounds fired by Individual Weapons, Candidate and Control S-C.

SN	ROUNDS
000440	578
000441	255
000442	225
000443	475
000444	588
Sub-Total	<u>2,121</u>

	<u>SN</u>	<u>ROUNDS</u>
C-SMG:	014614	335
	014619	547
	014643	204
	014653	267
	014656	568

Sub-Total	<u>1,921</u>
-----------	--------------

M4E1:

344708	155
344451	350

Sub-Total	<u>505</u>
-----------	------------

M3A1:

624900	555
624651	420

Sub-Total	<u>975</u>
-----------	------------

TOTAL	<u>5,522</u>
-------	--------------

b. Total Rounds by Ammunition Lot Number.

5.56MM

<u>LOT</u>	<u>ROUNDS FIRED</u>
WCC 6089	3,388
PA 5072	654
Sub-Total	<u>4,042</u>

7.62MM

	505
Sub-Total	<u>505</u>

.45 CALIBER

WCC 6672	975
Sub-Total	<u>975</u>
TOTAL	<u>5,522</u>

3. Summary of Test of Candidate Individual Weapons.

a. S-C.

Gun No 000440 a/

DATE	No Rd Fired	No Gun Rd	No of Stoppages	Type of Stoppage	CBIA* NCBI**	REMARKS
30 Aug 65	35	35	0			
16 Sep 65	36	71	0			
24 Sep 65	30	101	0			
27 Sep 65	90	191	0			
28 Sep 65	170	361	0			
19 Oct 65	45	406	1	LB <u>b/</u>	1	cause unk
15 Nov 65	172	578	2	FFR <u>c/</u>	2	cause unk: reseated and fired
Total:	578	578	3		3	

NOTE: a/ Transported weapon
b/ Light Blow
c/ Fail to fire

Gun No 000441

30 Aug 65	35	35	0
15 Sep 65	25	60	0
24 Sep 65	90	150	0
25 Sep 65	90	240	0
28 Sep 65	15	255	0
Total:	255	255	0

Gun No 000442

30 Aug 65	35	35	0
16 Sep 65	30	65	0
24 Sep 65	135	200	1
25 Sep 65	15	215	0
28 Sep 65	10	225	0
Total:	225	225	1

* Clearable by immediate action.
 **Not clearable by immediate action.

Gun No 000443

DATE	No Rd Fired	No Gun Rd	No of Stoppages	Type of Stoppage	CBIA*	NCBIA**	REMARKS
15 Sep 65	65	65	0				
24 Sep 65	150	215	0				
25 Sep 65	120	335	0				
15 Nov 65	140	475	0				
Total:	475	475	0				

Gun No 000444 2/

30 Aug 65	35	35	0				
15 Sep 65	25	60	0				
24 Sep 65	285	345	1	LB	1		cause unk
28 Sep 65	78	423	0				
19 Oct 65	45	468	0				
15 Nov 65	120	588	5	4 FJ	4		cause: possibly improper lub- rication
				1 FFR	1		cause unk
Total:	588	588	6		6		

NOTE: a/ Transported weapon

b. C-SMG.

Gun No 014

15 Sep 65	55	55	0
24 Sep 65	225	280	0
25 Sep 65	45	325	0
28 Sep 65	10	335	0
Total:	335	335	0

Gun No 014619

30 Aug 65	35	35	0
16 Sep 65	12	47	0
24 Sep 65	270	317	0
25 Sep 65	120	437	0
28 Sep 65	110	547	0
Total:	547	547	0

* Clearable by immediate action.

**Not clearable by immediate action.

Gun No 014643 a/

DATE	No Rm Fired	No Gun Rd	No of Stoppages	Type of Stoppage	CBIA* NCBI**	REMARKS
30 Aug 65	35	35	0			
15 Sep 65	17	52	4	Fail to cock	4	semi-automatic mode; cause unk
24 Sep 65	20	72	0			
28 Sep 65	20	92	0			
15 Nov 65	112	204	0			
Total:	204	204	4		4	

NOTE: a/ Transported weapon

Gun No 014653 a/

30 Aug 65	35	35	0
15 Sep 65	12	47	0
24 Sep 65	20	67	0
28 Sep 65	20	87	0
15 Nov 65	180	267	0
Total:	267	267	0

NOTE: a/ Transported weapon

Gun No 014656

30 Aug 65	35	35	0
15 Sep 65	58	53	0
24 Sep 65	180	263	0
25 Sep 65	105	368	0
28 Sep 65	50	428	0
15 Nov 65	1-	568	0
Total:	568	568	0

*Clearable by immediate action.

**Not clearable by immediate action.

Stoppage Summary, Candidate Individual Weapons.

a. Stoppages.

S-C - GUN NO 000410 (578 ROUNDS FIRED) a/

Type	No	Cause	Attributed to
LB	1	Unknown	
FPR	2	Unknown	

S-C - GUN NO 000442 (225 ROUNDS FIRED)

Type	No	Cause	Attributed to
------	----	-------	---------------

LB	1	Unknown	
----	---	---------	--

S-C - GUN NO 000444 (588 ROUNDS FIRED) a/

LB	1	Unknown	
FJ	1	Improper Lubrication	Gun
FFR	1	Unknown	

C-SMG - GUN NO 014643 (204 ROUNDS FIRED) a/

FC	4	Unknown	
----	---	---------	--

b. Recapitulation.

LB	3	Unknown	
FJ	4	Improper Lubrication	Gun
FC	4	Unknown	
FFR	3	Unknown	

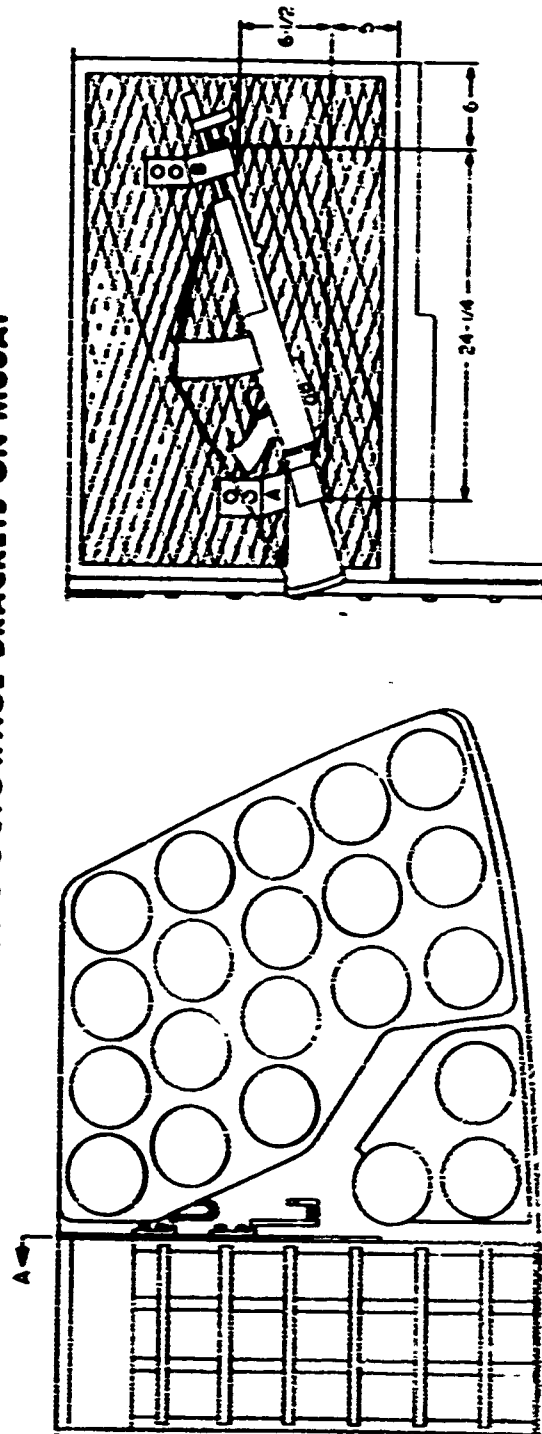
Totals	14		
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LEGEND:

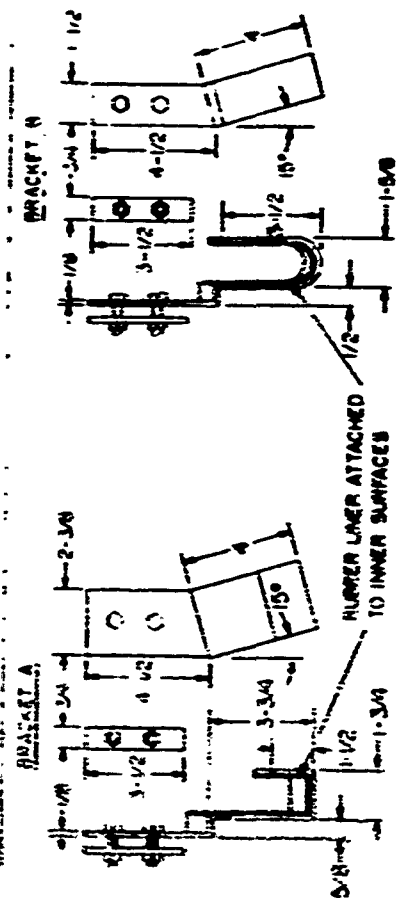
LB	Light Blow
FJ	Fail to Eject
FC	Fail to Cock
FFR	Fail to Fire

NOTE: a/. Transported weapon.

LOCATION OF S-C STOWAGE BRACKETS ON M60A1



SECTION A-A



ALL DIMENSIONS ARE IN INCHES

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APPENDIX II (C) - FINDINGS (U)

This appendix shows the extent to which design limitations, performance characteristics, and determinations or evaluations verified or made by this board in accordance with assigned responsibilities met or fell short of applicable specifications from characteristics and standards prepared by US Army Command Developments Command Infantry Agency for use as test criteria (references 1c and d, Forword). Criteria to be met and determinations or evaluations to be made are listed under REQUIREMENTS. Explanatory comment and cross-reference to applicable tests are shown under REMARKS. (NOTE: No Department of Army-approved qualitative materiel requirement (QMR) or military characteristics (MC) preceded development of the weapons tested under this project. The format in which characteristics and standards were furnished for use as test criteria reflects no distinction between items which may be considered essential and those which are desirable.)

REQUIREMENT

DEGREE OF ACHIEVEMENT

<u>Met</u>	<u>Fell</u>	<u>Not</u>	<u>Short</u>	<u>Determined</u>
------------	-------------	------------	--------------	-------------------

REMARKS

1. (C) GENERAL. These characteristics will be used to evaluate all candidate rifles, carbines, sub-machineguns.

2. (C) VERSATILITY. Determine the following capability of delivering selectively, both semi-automatic, full automatic

Para 2.1.3.6, 2.2.3,
2.2.4, 2.4.3.1,
2.4.3.2, and 2.7.4.1

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GROUP-4
downgraded at 5 years intervals.
Declassified after 15 years

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<u>REQUIREMENTS</u>	<u>DEGREE OF ACHIEVEMENT</u>			<u>REMARKS</u>
	<u>Met</u>	<u>Fell</u>	<u>Not Short Determined</u>	

and/or controlled burst automatic fire, and suitability for use in those roles in which compactness is essential; and maximum compactness of internal functional parts and ammunition with other weapons of the small arms weapons family. (Recommended by USA-CBCA/MA: Determine whether or not the configuration of individual candidate systems lends itself to ease of stowage within the tank, and permits rapid exit and entry of crew members from the tank while armed with the auxiliary weapon. See reference 1g, Foreword.

3. (C) PHYSICAL CHARACTERISTICS. Evaluate the following:

a. Configuration and Design.

(1) Simplicity in Design and X

Construction - maximum permitted
by other required characteristics.

Para 2.1.3.2

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<u>REQUIREMENTS</u>	<u>DEGREE OF ACHIEVEMENT</u>			<u>REMARKS</u>
	<u>Met</u>	<u>Fell</u>	<u>Not</u> <u>Short Determined</u>	
(2) <u>Weight</u> - minimum permitted by other required characteristics.	X			Para 2.1.3.2 and para 1, appendix I.
(3) <u>Length</u> - minimum permitted by other required characteristics; three-point support (chest and elbows) when firer is in the prone position desirable.	X			Para 2.1.3.2; para 1, appendix I; and page IV-1, appendix IV.
(4) <u>Safety(s)</u> - easily identifiable, conveniently located, positive safety(s) to prevent accidental firing and dangerous malfunctions; designed so that safe-fire position can be determined by touch and operation of safety(s) is inaudible.	X			Para 2.1.3.3 and 2.10.3.2
(5) <u>Sights</u> - (a) Simple and durable integral sight(s) having positive settings and appropriate visual scales for determining	X			Para 2.1.3.4

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REQUIREMENTS

DEGREE OF ACHIEVEMENT

REMARKS

"zero" and not requiring use of special tools for adjustment.

(b) Determine accuracy of sights out to 600 meters and additional range settings for ranges out to 1,000 meters or the maximum effective range of the weapon. Determine inherent capability to align on the target at night and other conditions of limited visibility (to include artificial illumination) provided the target can be detected with the unaided eye.

X

Para 2.1.3.4 and 2.3.3.2

(c) Evaluate performance when fired in conjunction with night sighting devices, as available.

✕

**Night vision devices
not available.**

(6) Magazine Ammunition Capacity - maximum permitted by other required

x

Para 2.1.3.5 and 2.1.4.1

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<u>REQUIREMENTS</u>	<u>DEGREE OF ACHIEVEMENT</u>			<u>REMARKS</u>
	<u>Met</u>	<u>Fell</u>	<u>Not</u>	
		<u>Short</u>	<u>Determined</u>	

characteristics. Determine suitability of magazines with minimum of 50 rounds point-fire ammunition. Evaluate suitability of magazines of lesser and greater capacities and use of factory packed, expendable (discardable) magazines, as available. Determine capability of loading the weapon (insertion of magazine) in one operation (from all firing positions).

b. Human Engineering Characteristics.

(1) Size and Shape - Determine capability of being fired from either the right or left shoulder in all normal firing positions by all military personnel meeting physical requirements of Department of the Army. Evaluate suitable stock designs to include use of

Para 2.10.3.1

X

H-5

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REQUIREMENTS

characteristics. Determine suitability of magazines with minimum of 50 rounds point-fire ammunition. Evaluate suitability of magazines of lesser and greater capacities and use of factory packed, expendable (discardable) magazines, as available. Determine capability of loading the weapon (insertion of magazine) in one operation (from all firing positions).

b. Human Engineering Characteristics.

(1) Size and Shape ..
Determine capability of being fired from either the right or left shoulder in all normal firing positions by all military personnel meeting physical requirements of Department of the Army. Evaluate suitable stock designs to include use of

H. 5

REMARKS

DEGREE OF ACHIEVEMENT

Met Fell Not
Short Determined

Para 2.10.3.1

X

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<u>REQUIREMENTS</u>	<u>DEGREE OF ACHIEVEMENT</u>			<u>REMARKS</u>
	<u>Met</u>	<u>Fell</u>	<u>Not</u> <u>Short Determined</u>	
pistol grip and adjustable stock lengths to accommodate firers of various physical conformation and improve weapon effectiveness.				
(2) <u>Safetys, Controls, Sights</u> - minimum number and designed so that they are easily located and identified by touch and operated with minimum of motion by the firer.	X			Para 2.1.3.3, 2.1.3.4, and 2.10.3.2
(3) <u>Recoil</u> - minimum to permit shoulder and hip firing point-fire.	X			Para 2.10.3.3
(4) <u>Blast and Noise</u> - Determine undue discomfort to the firer and evaluate against maximum level precluding injury.		X		Para 2.4.4.1, 2.5.3.2, 2.5.4.1, and 2.10.3.4

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REQUIREMENTS

(5) Portability - Determine relative comfort to carry and fire, to include projections which can readily entangle in brush, grass or battlefield obstacles. Evaluate suitability of accepting a carrying sling in a conventional manner. Determine suitability of being carried while getting in and out of tanks and other combat vehicles.

(6) Pointing Characteristics - Evaluate configuration, sight design, and balance of the weapon as they affect pointing characteristics.

(7) Heat - Determine effects on firer, weapon's performance, and safety caused by rapid or sustained firing.

DEGREE OF ACHIEVEMENT
Met Fell Not
Short Determined

Para 2.2.3.3, 2.4.3.1,
and 2.10.3.5

Para 2.10.3.6

Para 2.10.3.7

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<u>REQUIREMENTS</u>	<u>DEGREE OF ACHIEVEMENT</u>			<u>REMARKS</u>
	<u>Met</u>	<u>Fell</u>	<u>Not</u>	
		<u>Short</u>	<u>Determined</u>	
4. (C) <u>PERFORMANCE AND EFFECTIVENESS (Weapon and Ammunition Combination)</u>				
<u>Performance - Rate of Fire</u> Determine effect of full automatic mode cyclic rate of fire on accuracy and ability of firer to control the size of his bursts when firing from shoulder, hip, 3-point support on ground, and from bipod, as available.	X			Para 2.4.3.1 and 2.4.3.2
5. (C) <u>DURABILITY AND RELIABILITY CHARACTERISTICS.</u> Determine the following:				
a. <u>Malfunctions</u> - (to include failures to feed or fire) in terms of number of rounds fired and categorized as: clearable by immediate action; and requiring parts replacement or correction by echelons higher than the individual using the weapon.	X			Para 2.5.3.1, 2.6.3, 2.7.3.2, 2.8.3.1, and 2.8.3.2

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<u>REQUIREMENTS</u>	<u>DEGREE OF ACHIEVEMENT</u>		<u>REMARKS</u>
	<u>Met</u>	<u>Fell</u> <u>Short</u> <u>Not</u> <u>Determined</u>	
b. <u>ruggedness</u> - capability to withstand normal usage encountered in training and combat and of functioning for long periods without cleaning or lubrication.	X		Para 2.8.3.3, 2.8.3.4, and 2.8.4.1

6. (C) OPERATIONAL SUITABILITY. Evaluate the following:

a. Firer Exposure - exposure related to weapon configuration when firing from a tank or combat vehicle hatch or from positions on the ground adjacent to the tank.

X Para 2.4.3.3

b. "Soldier Proof" Features - such as tamper-proof controls, reversed assembly, firing without cleaning or lubricating, use of improper cleaning materials (gas, diesel fuel, etc.) and ruggedness.

X Para 2.4.3.4, 2.4.4.2, and 2.9.3.2

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<u>REQUIREMENTS</u>	<u>DEGREE OF ACHIEVEMENT</u>			<u>REMARKS</u>
	<u>Met</u>	<u>Feel</u> <u>Short</u>	<u>Not</u> <u>Determined</u>	
7. (C) MAINTENANCE CHARACTERISTICS. Evaluate the following:				
a. <u>Ease of Assembly and Disassembly</u> - ease of assembly and disassembly; and tools required.	X			Para 2.9.3.2 and 2.9.3.4
b. <u>Ease of Maintenance</u> - under combat conditions.	X			Para 2.9.3.2 and 2.9.3.3
c. <u>Design</u> - precluding reversed assembly which adversely affects weapon functioning (to include barrel change if appropriate).	X			Para 2.4.3.4 and 2.9.3.2
8. (C) TRAINING AIDS. Determine availability and suitability of training aids such as blank ammunition and blank firing attachments/devices, weapon instructional manuals and compatibility with current standard marksmanship training aids.		X		Para 2.11.3.4, 2.11.4.1, and 2.11.4.2. POMM only were furnished which were satisfactory.

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APPENDIX III (C) - DEFICIENCIES AND SHORTCOMINGS (U)

(C) DEFICIENCY (U)

<u>DEFICIENCY</u>	<u>SUGGESTED CORRECTIVE ACTION</u>	<u>REMARKS</u>
1. The C-SMG has excessive muzzle flash and blast.	None	Para 3b(4), appendix II and para 2.4.3.5, 2.4.4.1, 2.5.3.2, and 2.10.3.4

(U) SHORTCOMING

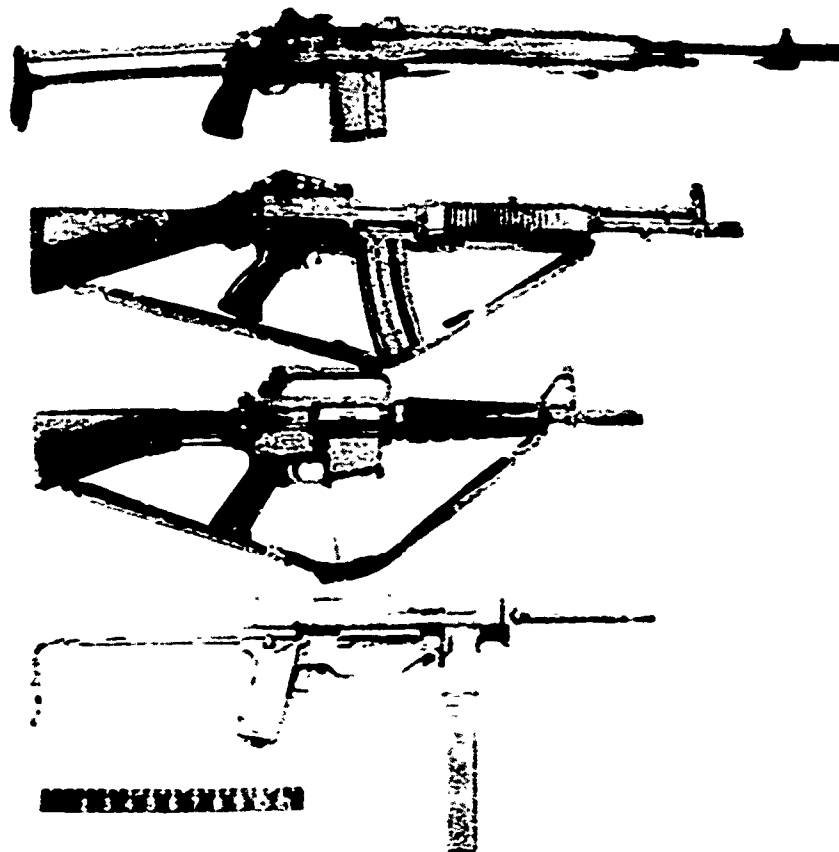
<u>SHORTCOMING</u>	<u>SUGGESTED CORRECTIVE ACTION</u>	<u>REMARKS</u>
2. The hand guards on two C-SMGs chipped at the junction with the hand guard cap during disassembly and reassembly.	None	Para 2.8.3.3

GROUP - 4

Upgraded to 15-minute intervals,
Declassified in 25 years.

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APPENDIX IV (U) - PHOTOGRAPHS



**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATCOM PROJ NO 8-5-0400-05
PHOTO NO 65-1696**

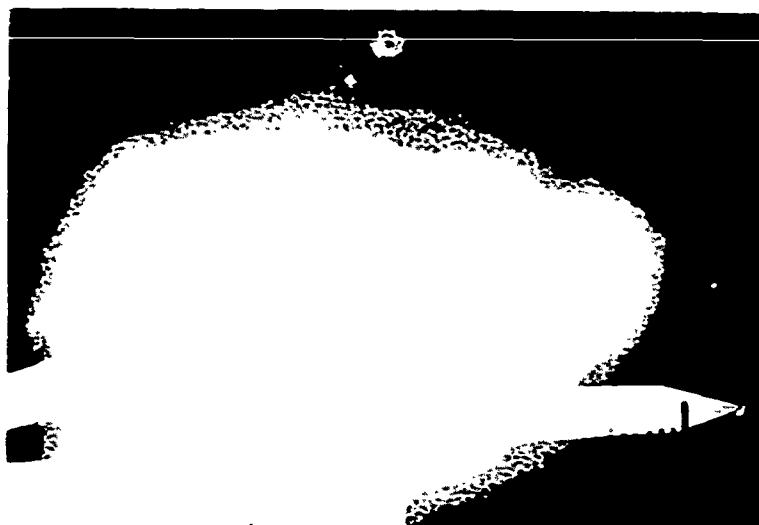
SMALL ARMS WEAPONS SYSTEMS

**TOP TO BOTTOM: 7.62MM RIFLE, M14E1 (TYPE III)
(COMPARISON WEAPON)**

5.56MM S-C (TEST WEAPON)

5.56MM C-SAG (TEST WEAPON)

**CALIBER .45 M3A1 SUBMACHINE
GUN (CONTROL WEAPON)**



**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2298F AND 65-2298G**

SMALL- ARMS WEAPONS SYSTEMS

**TOP: 5-ROUND BURST WITH C-SMG, AMMUNITION
LOT NUMBER WCC 6089**

**BOTTOM: SINGLE ROUND WITH C-SMG, AMMUNITION
LOT NUMBER WCC 6089**



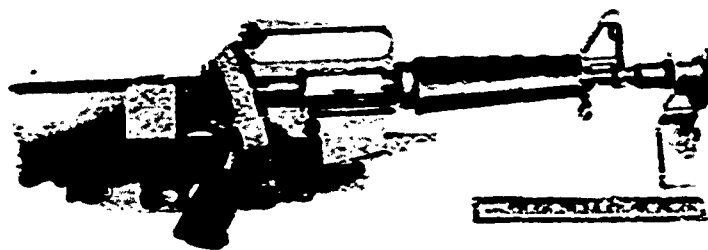
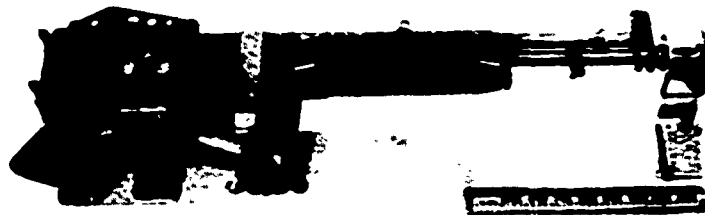
**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATECOM PROJ NO S-5-0400-05
PHOTO NO 65-2785C AND 65-2785E**

SMALL ARMS WEAPONS SYSTEMS

**TOP: 5-ROUND BURST WITH C-SMG. AMMUNITION
LOT NUMBER RA 5072**

**BOTTOM: SINGLE ROUND WITH C-SMG, AMMUNITION
LOT NUMBER RA 5072**



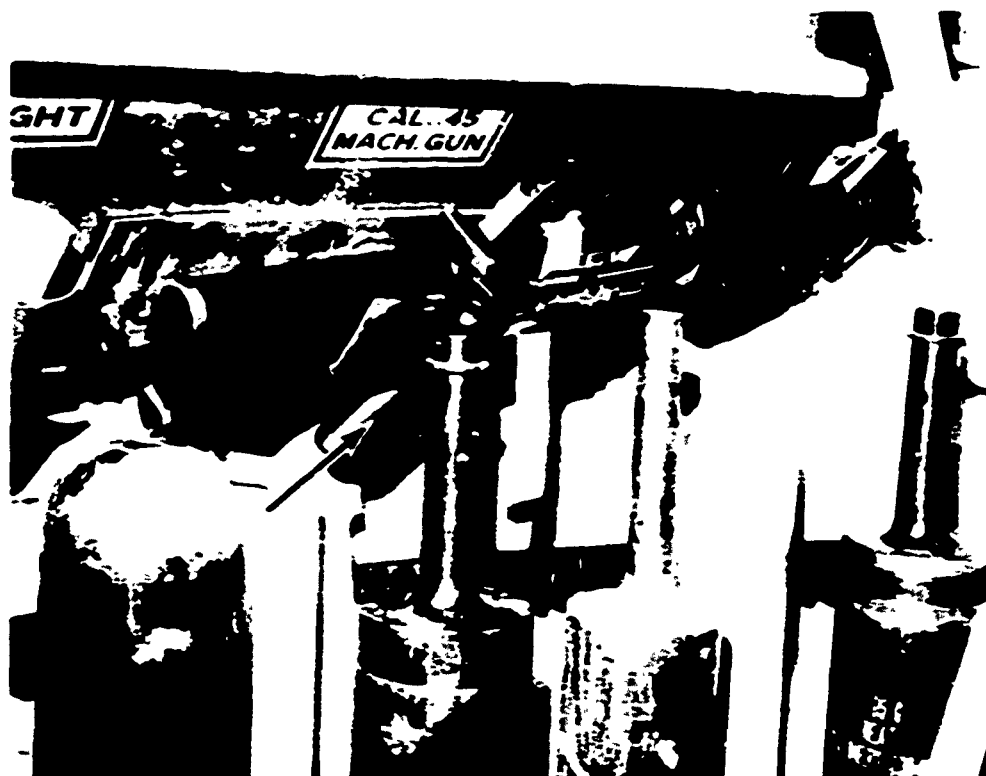
**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2071 AND 65-2072**

SMALL ARMS WEAPONS SYSTEMS

**TOP: INITIAL MODIFICATION OF STOWAGE RACK
FOR M60A1 TANK, WITH S-C IN PLACE.**

**BOTTOM: INITIAL MODIFICATION OF STOWAGE RACK
FOR M60A1 TANK, WITH C-SMG IN PLACE.**



US ARMY ARMOR BOARD
FORT KNOX, KY

USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2056

SMALL ARMS WEAPONS SYSTEMS

C-SMG STOWED AT LOADER'S STATION IN M60A1
TANK. ARROW SHOWS INTERFERENCE OF HEAT
ROUND WITH REMOVAL OF WEAPON FROM
STOWAGE RACK.



**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2750 AND 65-2750A**

SMALL ARMS WEAPONS SYSTEMS

**TOP: FABRICATED STOWAGE BRACKETS FOR
INDIVIDUAL WEAPONS LOCATED LEFT
OF TURRET BUSTLE READY RACK.**

BOTTOM: S-C STOWED.



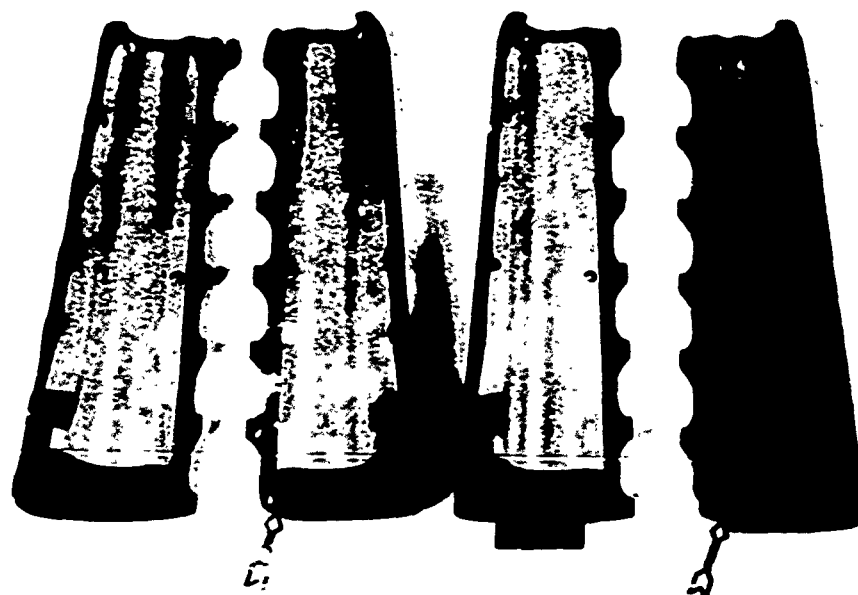
**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2938 AND 65-2939**

SMALL ARMS WEAPONS SYSTEMS .

**TOP: MODIFIED STOWAGE RACK (ARROWS) FOR
INDIVIDUAL WEAPON IN M60A1 TANK,
DRIVER'S STATION.**

**BOTTOM: MODIFIED STOWAGE RACK FOR INDIVIDUAL
WEAPON WITH S-C STOWED IN M60A1 TANK,
DRIVER'S STATION.**

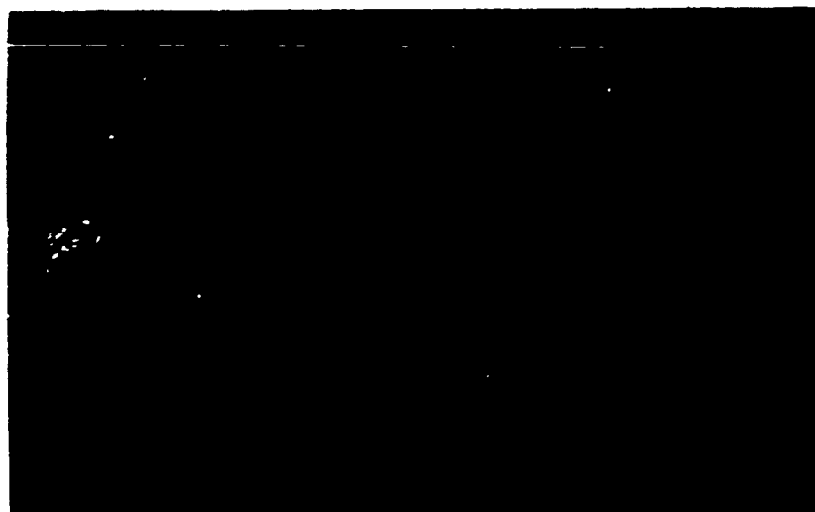
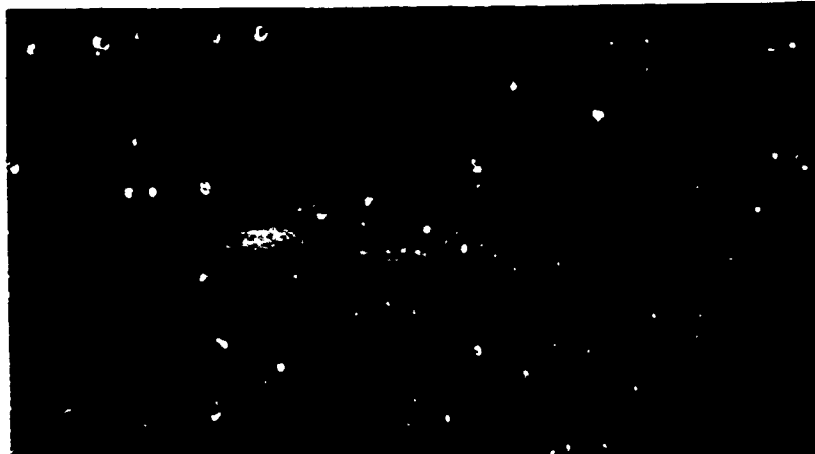


US ARMY ARMOR BOARD
FORT KNOX, KY

USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2261

SMALL ARMS WEAPONS SYSTEMS

**ARROWS INDICATE POINTS OF BINDING CAUSED BY
HAND GUARD CAPS ON C-SMG.**



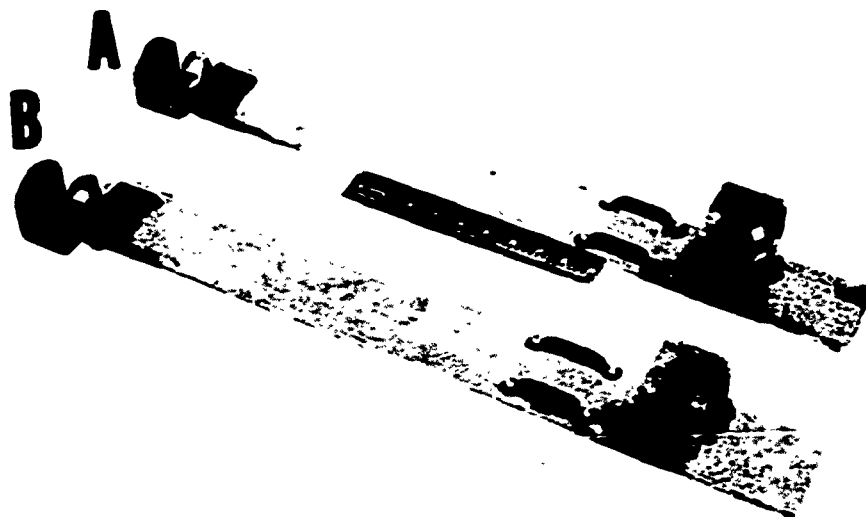
**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2298E AND 65-2299D**

SMALL ARMS WEAPONS SYSTEMS

**TOP: 5-ROUND BURST WITH S-C, AMMUNITION LOT
NUMBER WCC 6089.**

**BOTTOM: SINGLE ROUND WITH S-C, AMMUNITION LOT
NUMBER WCC 6089.**



**US ARMY ARMOR BOARD
FORT KNOX, KY**

**USATECOM PROJ NO 8-5-0400-05
PHOTO NO 65-2074**

SMALL ARMS WEAPONS SYSTEMS

- A. INITIAL MOUNT FOR STOWED INDIVIDUAL WEAPONS, M60A1 TANK, DRIVER'S STATION.**
- B. INITIAL MOUNT FOR STOWED INDIVIDUAL WEAPONS, M60A1 TANK, LOADER'S STATION.**

**NOTE: THESE BRACKETS INTERFERED WITH ITEM
USUALLY STOWED AT ABOVE STATIONS.**

APPENDIX V (U) - COORDINATION

(To be added)

SECTION 4 (U) - DISTRIBUTION LIST

**FINAL REPORT OF
USATECOM PROJECT NO 8-5-0400-05**

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Commanding General US Army Materiel Command ATTN: AMCPM-PMSO-RS	*3
Washington, D. C. 20315	
Commanding General US Army Combat Developments Command ATTN: USACDC Liaison Officer, USATECOM	*12
Aberdeen Proving Ground, Maryland 21005	
Commanding General US Army Munitions Command ATTN: AMSMU-RE	*5
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13. ABSTRACT Service Test of the S-C and C-SMG as vehicular-stowed weapons on combat vehicles for local security purposes and other dismounted action was conducted by the US Army Armor Board at Fort Knox, Kentucky during the period 1 September-15 November 1965. The S-C satisfied the test criteria and the C-SMG satisfied it except for excessive muzzle blast and flash. This was classified as a deficiency. Also, the hand guard on the C-SMG chipped (a shortcoming). It was concluded that both the S-C and the C-SMG offered significant advantages over the current standard caliber .45 Sub-Machine Gun, M3A1 in range, general utility, safety, and handling characteristics for its intended purpose, that the S-C as tested was suitable for US Army use as a combat vehicle-stowed individual weapon and that the C-SMG would be suitable when the deficiency is corrected, and that both the S-C and C-SMG were safe for their intended use. It was recommended that, subject to action by Department of the Army to adopt 5.56mm weapons on a scale for general use by ground troops, the S-C weapon be adopted for US Army use as a vehicle-stowed individual weapon for combat vehicle crew members (C)		

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14 (U)	KEY WORDS	LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
	Small Arms Weapons Systems C-SMG S-C 5.56MM Weapons Combat Vehicles - stowed weapons Sub-Machine Gun, Cal .45, M3A1 Individual weapons for combat vehicle crews M14E1 rifle						

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CODE SHEET

CODE S-C - Stoner 63 Carbine

Code C-SMG - Colt Car-15 Submachine Gun

Code S-FMG - Stoner 63 Fixed Machine Gun

Code C-FMG - Colt CMG-1, Fixed

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